



**... Fire Protection by Computer Design**

DEAN & ALLYN, INC.  
32 LEWISTON ROAD BUILDING 1C  
P.O. BOX 709  
GRAY, ME 04039  
207-657-5646

Job Name : MMC 2CND FLOOR RICHARDS  
Building : Richards Building  
Location : Maine Medical Center-22 Bramhall St-Portland, Me  
System : WX1  
Contract : C0810818  
Data File : MMC---2C.WX1

Hydraulic Design Information Sheet

Name - Second Floor Fire Protection Upgrade Date - 11/7/08  
 Location - Maine Medical Center-22 Bramhall St-Portland, Me  
 Building - Richards Building System No. - WX1  
 Contractor - Dean & Allyn, Inc Contract No. - C0810818  
 Calculated By - James R White Drawing No. - 1 of 1  
 Construction: ( ) Combustible (X) Non-Combustible Ceiling Height - 8'-0"  
 Occupancy - Hospital- PATIENT HOLDING ROOM

S (X) NFPA 13 (X) Lt. Haz. Ord.Haz.Gp. ( ) 1 ( ) 2 ( ) 3 ( ) Ex.Haz.  
 Y ( ) NFPA 231 ( ) NFPA 231C ( ) Figure Curve

S Other

T Specific Ruling Made By Date

M	Area of Sprinkler Operation	- 12 HEADS	System Type	Sprinkler/Nozzle
	Density	- .1	(X) Wet	Make VIKING
D	Area Per Sprinkler	- 138	( ) Dry	Model VK462
E	Elevation at Highest Outlet	- 8'-0"	( ) Deluge	Size 1/2"
S	Hose Allowance - Inside	- 100	( ) Preaction	K-Factor 5.6
I	Rack Sprinkler Allowance	- 0	( ) Other	Temp.Rat.155 deg
G	Hose Allowance - Outside	- 0		

N Note SAFETY MARGIN = 78.04 PSI - LARGEST ROOM +2 ( 12 HEADS)

Calculation Flow Required - 347.20 Press Required - 81.76  
 Summary C-Factor Used: 120 Overhead 120 Underground

W	Water Flow Test:	Pump Data:	Tank or Reservoir:
A	Date of Test - 10/11/07		Cap. -
T	Time of Test -	Rated Cap.-	Elev.-
E	Static Press - 170	@ Press -	
R	Residual Press - 75	Elev. -	Well
	Flow - 1160		Proof Flow
S	Elevation - 0		

P Location - RICHARDS FIRE PUMP

L Source of Information - ANNUAL PUMP TEST

C	Commodity N/A	Class	Location
O	Storage Ht. N/A	Area	Aisle W.
M	Storage Method:	%	Palletized % Rack
	( ) Single Row	( ) Conven. Pallet	( ) Auto. Storage ( ) Encap.
S	( ) Double Row	( ) Slave Pallet	( ) Solid Shelf ( ) Non
T	( ) Mult. Row		( ) Open Shelf

R K Flue Spacing N/A Clearance:Storage to Ceiling  
 A Longitudinal N/A Transverse N/A

G Horizontal Barriers Provided: N/A

# Fittings Used Summary

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## Fitting Legend

Abbrev.	Name	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	3 1/2	4	5	6	8	10	12	14	16	18	20	24
B	Generic Butterfly Valve	0	0	0	0	0	0	7	10	0	12	9	10	12	19	21	0	0	0	0	0
E	90' Standard Elbow	2	2	2	3	4	5	6	7	8	10	12	14	18	22	27	35	40	45	50	61
Fsp	Flow Switch Potter VSR	Fitting generates a Fixed Loss Based on Flow																			
G	Generic Gate Valve	0	0	0	0	1	1	1	1	1	2	2	3	4	5	6	7	8	10	11	13
Mbb	B Ball Milw BB-SC100			2.25	2	2.5	2.25	10													
N	CPVC 90'EI Harvel-Spears	7	7	7	8	9	11	12	13	0	0	0	0	0	0	0	0	0	0	0	0
O	CPVC Tee - Branch	3	3	5	6	8	10	12	15	0	0	0	0	0	0	0	0	0	0	0	0
S	Generic Swing Check Valve	4	5	5	7	9	11	14	16	19	22	27	32	45	55	65	76	87	98	109	130
T	90' Flow thru Tee	3	4	5	6	8	10	12	15	17	20	25	30	35	50	60	71	81	91	101	121

# Pressure / Flow Summary - STANDARD

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Node No.	Elevation	K-Fact	Pt Actual	Pn	Flow Actual	Density	Area	Press Req.
D001	16.0	5.6	7.0	na	14.82	0.1	115	7.0
D002	16.0	5.6	7.0	na	14.82	0.1	115	7.0
D003	30.083	5.6	8.03	na	15.87	0.1	80	7.0
D004	30.083	5.6	8.28	na	16.11	0.1	80	7.0
D005	30.083	5.6	12.94	na	20.15	0.1	96	7.0
D006	30.083	5.6	12.68	na	19.94	0.1	94	7.0
D007	30.083	5.6	13.33	na	20.45	0.1	94	7.0
D008	30.083	5.6	15.81	na	22.26	0.1	120	7.0
D009	30.083	5.6	23.31	na	27.04	0.1	80	7.0
D010	30.083	5.6	23.22	na	26.99	0.1	80	7.0
D011	30.083	5.6	18.21	na	23.9	0.1	138	7.0
D012	30.083	5.6	19.36	na	24.64	0.1	138	7.0
27	31.083		12.78	na				
28	31.083		13.32	na				
29	31.083		15.87	na				
26	31.083		7.11	na				
25	31.083		8.21	na				
24	31.083		7.95	na				
22	31.083		18.54	na				
23	31.083		19.52	na				
5	31.083		23.37	na				
17	31.083		23.42	na				
18	31.083		23.59	na				
19	31.083		24.03	na				
20	31.083		43.22	na				
21	31.083		43.31	na				
8	31.083		49.81	na				
15	31.083		63.14	na				
16	31.083		68.78	na				
14B	11.5		77.31	na				
1	31.083		6.88	na				
2	31.083		7.39	na				
3	31.083		8.53	na				
4	31.083		12.92	na				
6	31.083		23.5	na				
7	31.083		24.81	na				
9	31.083		49.4	na				
10	31.083		47.58	na				
11	31.083		51.58	na				
12	31.083		54.73	na	100.0			
13	31.083		68.35	na				
14	11.5		76.91	na				
14A	3.0		81.24	na				
TEST	3.0		81.76	na				

The maximum velocity is 27.63 and it occurs in the pipe between nodes 4 and 5

# Final Calculations - Hazen-Williams

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Hyd. Ref. Point	Qa  Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
D001 to EQ01	29.63 29.63	1.049 120 0.2693	1T	5.0 0.0 0.0	1.000 5.000 6.000	7.000 6.099 1.616			K Factor = 5.60 Vel = 11.00	
	0.0 29.63					14.715			K Factor = 7.72	
D002 to EQ02	29.63 29.63	1.049 120 0.2693	1E	2.0 0.0 0.0	1.000 2.000 3.000	7.000 6.099 0.808			K Factor = 5.60 Vel = 11.00	
	0.0 29.63					13.907			K Factor = 7.95	
D001 to 1	14.82 14.82	1.101 150 0.0390	1N	7.0 0.0 0.0	1.000 7.000 8.000	7.000 -0.433 0.312			K Factor = 5.60 Vel = 4.99	
	0.0 14.82					6.879			K Factor = 5.65	
D002 to 26	15.04 15.04	1.101 150 0.0674	1N	7.0 0.0 0.0	1.000 7.000 8.000	7.000 -0.433 0.539			K Factor = 5.60 Vel = 5.07	
	0.0 15.04					7.106			K Factor = 5.64	
D003 to 24	15.87 15.87	1.101 150 0.0444	1N	7.0 0.0 0.0	1.000 7.000 8.000	8.031 -0.433 0.355			K Factor = 5.60 Vel = 5.35	
	0.0 15.87					7.953			K Factor = 5.63	
D004 to 25	16.11 16.11	1.101 150 0.0455	1N	7.0 0.0 0.0	1.000 7.000 8.000	8.279 -0.433 0.364			K Factor = 5.60 Vel = 5.43	
	0.0 16.11					8.210			K Factor = 5.62	
D005 to 4	20.15 20.15	1.101 150 0.0690	1O	5.0 0.0 0.0	1.000 5.000 6.000	12.943 -0.433 0.414			K Factor = 5.60 Vel = 6.79	
	0.0 20.15					12.924			K Factor = 5.61	
D006 to 27	19.94 19.94	1.101 150 0.0676	1N	7.0 0.0 0.0	1.000 7.000 8.000	12.675 -0.433 0.541			K Factor = 5.60 Vel = 6.72	
	0.0 19.94					12.783			K Factor = 5.58	
D007 to 28	20.45 20.45	1.101 150 0.0708	1O	5.0 0.0 0.0	1.000 5.000 6.000	13.332 -0.433 0.425			K Factor = 5.60 Vel = 6.89	
	0.0 20.45					13.324			K Factor = 5.60	
D008 to 29	22.26 22.26	1.101 150 0.0830	1O	5.0 0.0 0.0	1.000 5.000 6.000	15.806 -0.433 0.498			K Factor = 5.60 Vel = 7.50	

# Final Calculations - Standard

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Hyd. Ref. Point	Qa  Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
	0.0 22.26									
						15.871			K Factor = 5.59	
D009 to 18	27.04  27.04	1.101 150 0.1188	1O	5.0 0.0 0.0	1.000 5.000 6.000	23.307 -0.433 0.713			K Factor = 5.60	
	0.0 27.04									
						23.587			K Factor = 5.57	
D010 to 6	26.99  26.99	1.101 150 0.1185	1O	5.0 0.0 0.0	1.000 5.000 6.000	23.224 -0.433 0.711			K Factor = 5.60	
	0.0 26.99									
						23.502			K Factor = 5.57	
D011 to 22	23.90  23.9	1.101 150 0.0946	1N	7.0 0.0 0.0	1.000 7.000 8.000	18.214 -0.433 0.757			K Factor = 5.60	
	0.0 23.90									
						18.538			K Factor = 5.55	
D012 to 23	24.64  24.64	1.101 150 0.1000	1O	5.0 0.0 0.0	1.000 5.000 6.000	19.355 -0.433 0.600			K Factor = 5.60	
	0.0 24.64									
						19.522			K Factor = 5.58	
27 to 28	19.94  19.94	1.101 150 0.0676		0.0 0.0 0.0	8.000 0.0 8.000	12.783 0.0 0.541				Vel = 6.72
28 to 29	20.44  40.38	1.101 150 0.2497	1O	5.0 0.0 0.0	5.200 5.000 10.200	13.324 0.0 2.547				Vel = 13.61
29 to 19	22.27  62.65	1.101 150 0.5626	1O	5.0 0.0 0.0	9.500 5.000 14.500	15.871 0.0 8.157				Vel = 21.11
	0.0 62.65									
						24.028			K Factor = 12.78	
26 to 2	15.04  15.04	1.101 150 0.0401	1O	5.0 0.0 0.0	2.000 5.000 7.000	7.106 0.0 0.281				Vel = 5.07
	0.0 15.04									
						7.387			K Factor = 5.53	
25 to 3	16.11  16.11	1.101 150 0.0457	1O	5.0 0.0 0.0	2.000 5.000 7.000	8.210 0.0 0.320				Vel = 5.43
	0.0 16.11									
						8.530			K Factor = 5.52	
24 to 3	15.87  15.87	1.101 150 0.0444	1O	5.0 0.0 0.0	8.000 5.000 13.000	7.953 0.0 0.577				Vel = 5.35
	0.0									

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Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv. Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
	15.87				8.530			K Factor = 5.43	
22 to 23	23.90 23.9	1.101 150 0.0945		10.410 0.0 10.410	18.538 0.0 0.984			Vel = 8.05	
23 to 7	24.64 48.54	1.101 150 0.3509	1O 5.0 0.0	10.080 5.000 15.080	19.522 0.0 5.291			Vel = 16.36	
	0.0 48.54				24.813			K Factor = 9.74	
5 to 17	28.51 28.51	1.598 150 0.0214		2.100 0.0 2.100	23.371 0.0 0.045			Vel = 4.56	
17 to 18	0.0 28.51	1.598 150 0.0214		8.000 0.0 8.000	23.416 0.0 0.171			Vel = 4.56	
18 to 19	27.04 55.55	1.598 150 0.0735		6.000 0.0 6.000	23.587 0.0 0.441			Vel = 8.89	
19 to 20	62.65 118.2	1.598 150 0.2966	1O 8.0 0.0	56.700 8.000 64.700	24.028 0.0 19.193			Vel = 18.91	
20 to 21	0.0 118.2	1.598 150 0.2968		0.310 0.0 0.310	43.221 0.0 0.092			Vel = 18.91	
21 to 10	0.0 118.2	1.598 150 0.2967	1O 8.0 0.0	6.370 8.000 14.370	43.313 0.0 4.263			Vel = 18.91	
	0.0 118.20				47.576			K Factor = 17.14	
8 to 15	150.24 150.24	1.598 150 0.4624	2O 16.0 0.0	12.830 16.000 28.830	49.807 0.0 13.331			Vel = 24.03	
15 to 16	0.0 150.24	2.469 120 0.0840	3E 18.0 1B 7.0 1Fsp 0.0	6.450 25.000 31.450	63.138 3.000 2.641			* Fixed loss = 3 Vel = 10.07	
16 to 14B	0.0 150.24	6.065 120 0.0011	1E 14.0 0.0	31.100 14.000 45.100	68.779 8.481 0.048			Vel = 1.67	
14B to 14A	0.0 150.24	6.065 120 0.0011	6E 84.0 2T 60.0 1G 3.0	91.000 147.000 238.000	77.308 3.681 0.252			Vel = 1.67	
	0.0 150.24				81.241			K Factor = 16.67	
1 to 2	14.82 14.82	1.101 150 0.0391	1O 5.0 0.0	8.000 5.000 13.000	6.879 0.0 0.508			Vel = 4.99	
2 to 3	15.04 29.86	1.101 150 0.1429		8.000 0.0 8.000	7.387 0.0 1.143			Vel = 10.06	

# Final Calculations - Standard

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Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
3	31.98	1.101			8.000	8.530				
to		150			0.0	0.0				
4	61.84	0.5492			8.000	4.394		Vel = 20.84		
4	20.15	1.101	1O	5.0	6.290	12.924				
to		150			5.000	0.0				
5	81.99	0.9253			11.290	10.447		Vel = 27.63		
5	-28.51	1.598			1.910	23.371				
to		150			0.0	0.0				
6	53.48	0.0686			1.910	0.131		Vel = 8.56		
6	26.99	1.598			9.000	23.502				
to		150			0.0	0.0				
7	80.47	0.1457			9.000	1.311		Vel = 12.87		
7	48.53	1.598	1O	8.0	63.660	24.813				
to		150			8.000	0.0				
8	129.0	0.3488			71.660	24.994		Vel = 20.64		
8	-150.24	1.598	1O	8.0	24.910	49.807				
to		150			8.000	0.0				
9	-21.24	-0.0124			32.910	-0.408		Vel = 3.40		
9	0.0	1.598	2N	18.0	129.120	49.399				
to		150			18.000	0.0				
10	-21.24	-0.0124			147.120	-1.823		Vel = 3.40		
10	118.20	1.598	1O	8.0	11.450	47.576				
to		150			8.000	0.0				
11	96.96	0.2057			19.450	4.000		Vel = 15.51		
11	0.0	1.598	1N	9.0	6.330	51.576				
to		150			9.000	0.0				
12	96.96	0.2056			15.330	3.152		Vel = 15.51		
12	100.00	2.067	3E	15.0	4.020	54.728		Qa = 100		
to		120	1Mbb	2.25	28.250	3.000		* Fixed loss = 3		
13	196.96	0.3293	1S	11.0	32.270	10.625		Vel = 18.83		
			1Fsp	0.0						
13	0.0	6.065	1E	14.0	31.100	68.353				
to		120			14.000	8.481				
14	196.96	0.0018			45.100	0.079		Vel = 2.19		
14	0.0	6.065	7E	98.0	207.000	76.913				
to		120	2T	60.0	164.000	3.681				
14A	196.96	0.0017	2G	6.0	371.000	0.647		Vel = 2.19		
14A	150.24	6.065	2E	28.0	12.000	81.241				
to		120	1T	30.0	93.000	0.0				
TEST	347.2	0.0050	1G	3.0	105.000	0.521		Vel = 3.86		
			1S	32.0						
	0.0									
	347.20					81.762		K Factor = 38.40		



# Water Supply Curve (C)

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City Water Supply:  
C1 - Static Pressure : 170  
C2 - Residual Pressure: 75  
C2 - Residual Flow : 1160

Demand:  
D1 - Elevation : 11.730  
D2 - System Flow : 247.198  
D2 - System Pressure : 81.762  
Hose ( Adj City ) : \_\_\_\_\_  
Hose ( Demand ) : 100  
D3 - System Demand : 347.198  
Safety Margin : 78.039

